

**TOXIC SUBSTANCES MONITORING PROGRAM
1992-93
DATA REPORT**

95-1WQ

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Field and Laboratory Operations Conducted by the
Water Pollution Control Laboratory
California Department of Fish and Game

**STATE WATER RESOURCES CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY**

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Toxic Substances Monitoring Program - 1992-93 Data Report

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LIST OF ABBREVIATIONS

DBP	Dichlorobenzophenone
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DDMS	Dichlorodiphenylmonochlorosaturatedethane
DDMU	Dichlorodiphenylmonochlorounsaturatedethane
DFG	California Department of Fish and Game
d/s	Downstream
EDL	Elevated Data Level(s)
FDA or (USFDA)	United States Food and Drug Administration
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
MIS	Median International Standard(s)
MTRL	Maximum Tissue Residue Level(s)
NAS	National Academy of Sciences
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
ppb	Parts Per Billion (ng/g)
ppm	Parts Per Million (ug/g)
RWQCBs	California Regional Water Quality Control Boards
SWRCBs	California State Water Resources Control Board
TSMP	Toxic Substances Monitoring Program
USEPA	United States Environmental Protection Agency
u/s	Upstream

1. TOXIC SUBSTANCES MONITORING PROGRAM

1992-93

Introduction

The Toxic Substances Monitoring Program (TSMP) was initiated in 1976 by the California State Water Resources Control Board (SWRCB). The TSMP was organized to provide a uniform statewide approach to the detection and evaluation of the occurrence of toxic substances in fresh, estuarine, and marine waters of the State through the analysis of fish and other aquatic life. The TSMP primarily targets water bodies with known or suspected impaired water quality and is not intended to give an overall water quality assessment. The California Department of Fish and Game (DFG) carries out the statewide TSMP for the SWRCB by collecting and analyzing samples. The SWRCB provides funding for the program under an ongoing interagency agreement with the DFG. Sampling stations are selected primarily by the nine Regional Water Quality Control Boards (RWQCB) which are identified on the inside back cover.

The DFG reports annual sampling results to the SWRCB. The information is transmitted to the RWQCBs and to other federal, State, and local agencies in the form of an annual TSMP report. The report provides information on the statewide occurrence and levels of toxic substances and the data can be used by the RWQCBs and other agencies to identify waters impacted by toxic pollutants and to eventually abate such problems. This report presents the results of the 1992 and 1993 sampling and analysis programs. The raw data from the 1992 and 1993 sampling programs have already been released to the RWQCBs, other State agencies, and to the interested public. This report is the formal report on the 1992 and 1993 programs. The TSMP reports are routinely transmitted to the Office of Environmental Health Hazard Assessment (OEHHA) of the California Environmental Protection Agency, which has responsibility for evaluating pollutant levels based on human health concerns and issuing fish consumption health advisories if indicated.

TSMP results are used by the SWRCB and RWQCBs in the statewide Water Quality Assessment. Water bodies are classified from good to impaired water quality relative to each other and ranked according to this classification and resource value. TSMP results are used to assist in the ranking process. For example, water bodies that exceed human health criteria are considered more impaired than water bodies that only exceed environmental protection criteria. TSMP results are also used in the regulatory activities of the RWQCBs and the Department of Pesticide Regulation.

Summary

Table 1 and 2 list the 108 stations (91 water bodies) sampled in 1992 and the 72 stations (60 water bodies) sampled in 1993. Regional maps showing 1992 and 1993 station locations are in Appendix A. Station location descriptions and latitude and longitude information can be found in Appendices B and C, respectively. In 1992, 40 stations were sampled for the first time, while 26 stations were sampled for the first time in 1993. Fourteen stations were sampled in 1992 as part of a special urban lake survey initiated in 1991 in Region 4. A total of 127 fish samples and four turtle samples were analyzed in 1992 and 82 fish samples were analyzed in 1993 (Appendix D). In addition, metal and organic chemical analysis were performed on sediment samples from Regions 3, 4, and 6 in 1992 and organic chemical analysis was performed on three sediment samples from Regions 4, 6, and 7 in 1993 (Appendices E and F). Black

perch, riffle sculpin, and yellowfin croaker were analyzed for the first time in the TSMP in 1992. In 1993, barred surfperch and lake trout were analyzed for the first time. Species collected in 1992 and 1993 are listed in Table 3 (freshwater fish), Table 4 (marine fish), and Table 5 (non-fish species).

Sampling results were compared to criteria such as Maximum Tissue Residue Levels (MTRLs), U.S. Food and Drug Administration (FDA) action levels, Median International Standards (MIS), and the National Academy of Sciences (NAS) recommended guidelines for predator protection (see section 3. Administrative and Comparative Criteria). MTRLs were developed from human health water quality objectives in the *Draft November 26, 1990 Functional Equivalent Document - Development of Water Quality Plans For: Inland Surface Waters of California and Enclosed Bays and Estuaries of California* (SWRCB 1990a), the *Draft April 9, 1991 Supplement to the Functional Equivalent Document* (SWRCB 1991), and the *1990 California Ocean Plan* (SWRCB 1990b). Freshwater MTRLs were exceeded at 27 water bodies in all regions, except Region 8 (Appendix G). Marine MTRLs were exceeded at seven water bodies in Regions 4 and 8 (Appendix H). FDA action levels were exceeded in four samples in 1992 and in six samples in 1993. The FDA action level for mercury was exceeded in three samples of largemouth bass and one sample of Sacramento squawfish from two stations on Lake Nacimiento in Region 3 (Appendix I). Bluegill from Klau Mine Pond in Region 3 and largemouth bass from Sherwood Lake in Region 4 also exceeded the FDA action level for mercury. The FDA action level for chlordane was exceeded in two samples collected in 1993 (Appendix J). Goldfish from Oxnard Drainage Ditch 2 and carp from Harbor Park Lake, both in Region 4, contained high levels of chlordane. The goldfish sample from Oxnard Drainage Ditch 2 along with a carp sample from the Alamo River in Region 7 also contained DDT exceeding the FDA action level. Mercury exceeded the MIS in samples from seven water bodies in Regions 1, 3, 4, 6, and 7 (Appendix I). Selenium exceeded the MIS at only one station, Lindero Lake in Region 4 (Appendix I). The NAS guidelines for organic chemicals were exceeded in 26 samples from 17 water bodies in Regions 3, 4, 7, 8, and 9 (Appendix J).

Three trace elements or metals copper, lead, and silver, were found at the highest concentrations found to date statewide. A 1993 striped mullet sample from Ballona Creek in Region 4 contained 1,300 ppm copper in the liver. The previous high copper concentration (600 ppm) occurred in the liver of white bass collected in 1984 from Lake Nacimiento in Region 3. The Ballona Creek sample also contained the highest level of silver at 12 ppm. Tilapia collected in 1989 from the San Gabriel River contained the previous high silver concentration at 5.4 ppm. Two 1992 samples, black perch and white croaker, contained the highest lead concentrations found to date. Black perch from Newport Bay in Region 8 contained 5 ppm lead in the liver, while white croaker from Dominguez Channel in Region 4 contained 3.2 ppm lead. A 1990 whole sample of California killifish from Famosa Slough in Region 9 contained the previous high level of lead at 1.4 ppm. Zinc was found at the third highest statewide concentration (64 ppm) in a 1992 whole sample of red shiner from the Coachella Valley Stormwater Channel in Region 7. The two highest zinc concentrations (74 and 67 ppm) were detected in 1980 in Regions 7 and 9.

The pesticide dacthal continues to be found in high levels in the Imperial Valley (Region 7). Carp collected in 1993 from the Alamo River contained dacthal at a concentration of 2,700 ppb in the filet. Channel catfish collected from the same station in 1979 also contained dacthal at 2,700 ppb in the filet. The 10 highest dacthal concentrations statewide all come from samples collected in the Imperial Valley. The pesticide ethion was detected for the first time in 1992 in Regions 3, 4, and 7. A total of five samples in 1992 and four samples in 1993 contained ethion. The highest concentration was 170 ppb in a 1992 whole sample of starry flounder, a marine species, from the mouth of the Santa Maria River in Region 3. The

highest concentration of ethion found in fresh water (150 ppb) was detected in a whole fathead minnow sample collected in 1992 from Conejo Creek in Region 4. The Santa Maria River sample also contained the third highest level of the pesticide endrin (100 ppb) found in the State. A white croaker sample from the Dominguez Channel contained the fourth highest PCB concentration detected statewide. Only three samples collected in 1980 from the South Fork of the Feather River exceeded the 1,780 ppb PCB found in the Dominguez Channel in 1992. The level of PCBs detected in the white croaker is not surprising since there is a health warning issued by OEHHA because of elevated PCB levels in marine fish in the area.

Additional tabular summaries of chemistry data are provided in Appendices K through Q. Marine fish samples exceeding criteria are summarized in Appendix K (trace elements) and Appendix L (organic chemicals). Lipid weight data exceedances are summarized in Appendix M (freshwater) and Appendix N (marine). Summaries of all chemistry data are provided in Appendix O (trace elements), Appendix P (organic chemicals), and Appendix Q (lipid weight data). A complete TSMP sampling history is provided in Appendix R.

TABLE 1
1992 Toxic Substances Monitoring Program

Station Name	Sample		Collection Date	Analyses
<u>Region 1</u>				
Beaughton Creek/d/s Highway 97 Bridge	Brown Trout	(BN)	09/01/92	Metals, Organics
Big Sulfur Creek	Sacramento Squawfish	(SQF)	10/07/92	Metals, Organics
Carrville Pond	Black Bullhead	(BLB)	08/31/92	Metals, Organics
	Rainbow Trout	(RBT)	08/31/92	Metals, Organics
Estero Americano	Threespine Stickleback	(STB)	07/22/92	Metals
Estero De San Antonio	Shiner Perch	(SSP)	07/22/92	Metals
Klamath River/Straits Drain*	Tui Chub	(TC)	09/02/92	Metals, Organics
Klamath River/u/s Copco Reservoir*	Rainbow Trout	(RBT)	09/02/92	Metals, Organics
Lake Mendocino	Redear Sunfish	(RSF)	11/07/92	Metals, Organics
	Redear Sunfish	(RSF)	10/07/92	Metals, Organics
Lake Pillsbury	Largemouth Bass	(LMB)	10/06/92	Metals
	Sacramento Squawfish	(SQF)	10/06/92	Hg, Se
Lake Pillsbury/Eel River Arm*	Largemouth Bass	(LMB)	10/06/92	Metals
	Largemouth Bass	(LMB)	10/06/92	Hg, Se
Lake Sonoma	Largemouth Bass	(LMB)	10/07/92	Metals
Lost River/Canal D*	Tui Chub	(TC)	09/03/92	Metals, Organics
	Sacramento Perch	(SP)	09/03/92	Metals, Organics
Lost River/Tule Lake	Tui Chub	(TC)	09/04/92	Metals, Organics
Mark West Creek	Sucker	(SKR)	10/08/92	Metals, Organics
Russian River/Duncans Mills	Prickly Sculpin	(PCP)	07/22/92	Metals, Organics
Russian River/Odd Fellows Park Bridge	Green Sunfish	(GSF)	07/23/92	Metals, Organics
Russian River/Wohler Bridge	Smallmouth Bass	(SMB)	10/08/92	Metals, Organics
Shasta River	Speckled Dace	(DC)	09/01/92	Metals
	Speckled Dace	(DC)	09/01/92	Metals
<u>Region 2</u>				
Alameda Creek/Niles Canyon Road	Sucker	(SKR)	07/15/92	Hg, Se, Organics
Napa River/Napa	Riffle Sculpin	(RCP)	07/27/92	Metals, Organics
Petaluma River/Lakeville*	Yellowfin Goby	(YFG)	07/28/92	Metals, Organics
Stevens Creek	Steelhead Rainbow Trout	(SH)	07/15/92	Metals, Organics
Suisun Slough/d/s Cordelia Slough*	Starry Flounder	(STF)	09/09/92	Metals, Organics
Walker Creek	Threespine Stickleback	(STB)	07/27/92	Metals, Organics
Walnut Creek	Green Sunfish	(GSF)	07/15/92	Metals, Organics
<u>Region 3</u>				
Chorro Creek/d/s Water Treatment Plant*	Threespine Stickleback	(STB)	08/04/92	Metals, Organics
Chorro Creek/Lower*	California Killifish	(CKF)	08/05/92	Metals, Organics
	California Killifish	(CKF)	08/05/92	Metals, Organics
Chorro Creek/u/s Chorro Reservoir*	Steelhead Rainbow Trout	(SH)	08/08/92	Metals, Organics
Lake Nacimiento/Dip Creek	Largemouth Bass	(LMB)	08/06/92	Metals
	Sediment	(SED)	08/06/92	Metals
Los Osos Creek/d/s Los Osos*	California Killifish	(CKF)	08/05/92	Metals, Organics
	Rainbow Trout	(RBT)	08/05/92	Metals, Organics

* Stations sampled for the first time in 1992.

TABLE 1 (continued)
1992 Toxic Substances Monitoring Program

Station Name	Sample		Collection Date	Analyses
Salinas River/Blanco Drain	Hitch	(HCH)	08/11/92	Metals, Organics
Santa Maria River/Mouth	Starry Flounder	(STF)	08/04/92	Organics
Soquel Creek*	Prickly Sculpin	(PCP)	08/12/92	Metals, Organics
Sweet Springs Marsh/Los Osos*	Threespine Stickleback	(STB)	08/05/92	Metals, Organics
Watsonville Slough/Estuary*	Pacific Staghorn Sculpin	(STG)	08/12/92	Metals, Organics
<u>Region 4</u>				
Belvedere Park Lake#	Fathead Minnow	(FHM)	04/25/92	Metals, Organics
Calabasas Lake#	Largemouth Bass	(LMB)	04/22/92	Metals, Organics
Calleguas Creek	Fathead Minnow	(FHM)	06/02/92	Organics
	Sediment	(SED)	06/02/92	Organics
Casitas Lake	Largemouth Bass	(LMB)	06/03/92	Metals, Organics
Colorado Lagoon*	Yellowfin Croaker	(YFC)	06/27/92	Metals, Organics
Conejo Creek	Fathead Minnow	(FHM)	06/02/92	Metals, Organics
	Fathead Minnow	(FHM)	06/02/92	Metals, Organics
Dominguez Channel*	White Croaker	(WCK)	06/28/92	Metals, Organics
Echo Park Lake#	Largemouth Bass	(LMB)	04/24/92	Metals, Organics
El Dorado Park Lake#	Largemouth Bass	(LMB)	04/26/92	Metals, Organics
Harbor Park Lake#	Largemouth Bass	(LMB)	04/26/92	Metals, Organics
Legg Lake#	Largemouth Bass	(LMB)	04/25/92	Metals, Organics
Lincoln Park Lake#	Largemouth Bass	(LMB)	04/24/92	Metals, Organics
Lindero Lake#	Largemouth Bass	(LMB)	04/22/92	Metals, Organics
Los Angeles River/Los Feliz Road*	Fathead Minnow	(FHM)	06/28/92	Metals, Organics
	Sediment	(SED)	06/28/92	Metals, Organics
Los Angeles River/Sepulveda Basin	Fathead Minnow	(FHM)	06/28/92	Metals, Organics
	Sediment	(SED)	06/28/92	Metals, Organics
Malibou Lake#	Largemouth Bass	(LMB)	04/23/92	Metals, Organics
Malibu Creek/Tapia Park*	Arroyo Chub	(AC)	06/03/92	Metals, Organics
	Sediment	(SED)	06/03/92	Metals, Organics
Mugu Lagoon	Gray Smoothhound Shark	(GSS)	06/04/92	Metals, Organics
	Sediment	(SED)	06/04/92	Metals, Organics
Peck Road Lake#	Largemouth Bass	(LMB)	04/27/92	Metals, Organics
Puddingstone Reservoir#	Largemouth Bass	(LMB)	04/28/92	Metals, Organics
Revolon Slough	Goldfish	(GF)	06/02/92	Organics
	Sediment	(SED)	06/02/92	Organics
San Gabriel River	Mozambique Tilapia	(TLM)	06/26/92	Metals, Organics
	Sediment	(SED)	06/26/92	Metals, Organics
San Gabriel River/Coyote Creek*	Mozambique Tilapia	(TLM)	06/26/92	Metals, Organics
Santa Clara River/Santa Paula	Arroyo Chub	(AC)	06/29/92	Organics
Santa Clara River/Valencia	Arroyo Chub	(AC)	09/15/92	Metals, Organics
	Arroyo Chub	(AC)	09/15/92	Metals, Organics
	Sediment	(SED)	06/15/92	Organics
Santa Fe Dam Park*#	Largemouth Bass	(LMB)	04/27/92	Metals, Organics
Sherwood Lake#	Largemouth Bass	(LMB)	04/21/92	Metals, Organics
Westlake Lake#	Largemouth Bass	(LMB)	04/21/92	Metals, Organics

* Stations sampled for the first time in 1992.

Urban Lake Survey.

TABLE 1 (continued)
1992 Toxic Substances Monitoring Program

Station Name	Sample		Collection Date	Analyses
<u>Region 5</u>				
Sacramento River/Hood	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
	White Catfish	(WCF)	11/04/92	Hg, Organics
Sacramento River/Keswick	Rainbow Trout	(RBT)	10/27/92	Metals
San Joaquin River/Mossdale*	Largemouth Bass	(LMB)	11/09/92	Organics
<u>Region 6</u>				
Boca Reservoir*	Rainbow Trout	(RBT)	10/23/92	Metals, Organics
Bodie Creek/Flying M Club*	Lahontan Cutthroat Trout	(LCT)	08/25/92	Metals
Convict Lake*	Brown Trout	(BN)	08/27/92	Metals
Hot Creek/d/s Hatchery*	Brown Trout	(BN)	08/26/92	Metals
June Lake*	Brown Trout	(BN)	08/25/92	Metals
Lake Tahoe/Homewood*	Brown Trout	(BN)	10/23/92	Metals
Little Rock Creek Reservoir	Golden Shiner	(GSH)	09/15/92	Metals
Mammoth Creek*	Brown Trout	(BN)	08/26/92	Metals
McGee Creek*	Brown Trout	(BN)	08/26/92	Metals
Robinson Creek*	Brown Trout	(BN)	08/24/92	Metals
Trout Creek/Truckee/d/s Meeks Lumber*	Sediment	(SED)	10/27/92	Metals
Trout Creek/Truckee/u/s Meeks Lumber*	Sediment	(SED)	10/27/92	Metals
Virginia Creek/Dog Town*	Brown Trout	(BN)	08/24/92	Metals
Willow Creek/Highway 139*	Tui Chub	(TC)	09/04/92	Metals, Organics
<u>Region 7</u>				
Alamo River/Calipatria	Spiny Soft Shelled Turtle	(SST)	09/20/92	Metals, Organics
Barbara Worth Drain*	Sailfin Molly	(MOL)	09/17/92	Metals, Organics
Coachella Valley Stormwater Channel	Red Shiner	(PRS)	09/16/92	Metals, Organics
Colorado River/Needles	Largemouth Bass	(LMB)	09/23/92	Metals, Organics
Colorado River/u/s Imperial Dam	Largemouth Bass	(LMB)	09/21/92	Metals, Organics
Greeson Drain	Redbelly Tilapia	(TLZ)	09/18/92	Metals, Organics
New River/Westmorland	Spiny Soft Shelled Turtle	(SST)	09/18/92	Metals, Organics
	Channel Catfish	(CCF)	09/20/92	Metals, Organics
	Spiny Soft Shelled Turtle	(SST)	09/20/92	Metals, Organics
Palo Verde Outfall Drain	Flathead Catfish	(FCF)	09/22/92	Metals, Organics
	Carp	(CP)	09/22/92	Hg, Se, Organics
Peach Drain	Sailfin Molly	(MOL)	09/17/92	Metals, Organics
Reservation Main Drain	Channel Catfish	(CCF)	09/21/92	Metals, Organics
South Central Drain	Spiny Soft Shelled Turtle	(SST)	09/18/92	Metals, Organics

* Stations sampled for the first time in 1992.

TABLE 1 (continued)
1992 Toxic Substances Monitoring Program

Station Name	Sample	Collection Date	Analyses
<u>Region 8</u>			
Anza Channel	Fathead Minnow	(FHM) 06/06/92	Metals, Organics
	Fathead Minnow	(FHM) 06/06/92	Metals, Organics
Big Bear Lake	Largemouth Bass	(LMB) 06/05/92	Metals
Huntington Harbour/Anaheim Bay	Black Perch	(BP) 06/07/92	Metals, Organics
Newport Bay	Black Perch	(BP) 06/08/92	Metals, Organics
Peters Canyon Channel	Red Shiner	(PRS) 06/07/92	Metals, Organics
San Diego Creek/Barranca Parkway	Red Shiner	(PRS) 06/06/92	Metals, Organics
San Diego Creek/Michelson Drive	Red Shiner	(PRS) 06/06/92	Metals, Organics
Santa Ana River/Prado Dam	Yellow Bullhead	(YB) 06/05/92	Metals, Organics
<u>Region 9</u>			
Escondido Creek/Camino Del Norte*	Carp	(CP) 06/10/92	Metals, Organics
Escondido Creek/County Club Drive*	Green Sunfish	(GSF) 06/10/92	Metals, Organics
Escondido Creek/Elfin Forest Park*	Green Sunfish	(GSF) 06/10/92	Metals, Organics
Forester Creek/Billy Mitchel Road*	Green Sunfish	(GSF) 06/09/92	Metals, Organics
Rainbow Creek	Arroyo Chub	(AC) 06/24/92	Metals, Organics
San Diego River/Mission Center Drive*	White Crappie	(WCR) 06/24/92	Metals, Organics
San Luis Rey River/Highway 15	Largemouth Bass	(LMB) 06/24/92	Metals, Organics
San Luis Rey River/Panky Road*	Largemouth Bass	(LMB) 06/24/92	Metals, Organics
Sweetwater Marsh	Longjaw Mudsucker	(LJM) 06/09/92	Metals, Organics
Tijuana Estuary	Longjaw Mudsucker	(LJM) 06/09/92	Metals, Organics

* Stations sampled for the first time in 1992.

TABLE 2
1993 Toxic Substances Monitoring Program

Station Name	Sample		Collection Date	Analyses
<u>Region 1</u>				
Klamath River/Straits Drain	Tui Chub	(TC)	10/07/93	Metals, Organics
Lake Mendocino	Redear Sunfish	(RSF)	09/09/93	Hg
	Largemouth Bass	(LMB)	09/09/93	Hg
Lake Pillsbury	Largemouth Bass	(LMB)	09/10/93	Hg
	Largemouth Bass	(LMB)	09/10/93	Hg
Lake Pillsbury/Eel River Arm	Largemouth Bass	(LMB)	09/10/93	Metals
	Sacramento Squawfish	(SQF)	09/10/93	As,Cd,Hg,Ni,Se
Lake Sonoma	Redear Sunfish	(RSF)	09/09/93	As,Cd,Hg,Ni,Se
	Redear Sunfish	(RSF)	09/09/93	As,Cd,Hg,Ni,Se
	Largemouth Bass	(LMB)	09/09/93	As,Cd,Hg,Ni,Se
Lost River/Canal N*	Tui Chub	(TC)	10/07/93	Hg, Se, Organics
Lost River/Tule Lake	Tui Chub	(TC)	10/07/93	Metals, Organics
Mark West Creek	White Crappie	(WCR)	09/08/93	Metals
<u>Region 2</u>				
Napa River/Napa	Riffle Sculpin	(RCP)	08/24/93	Metals
Petaluma River/Petaluma*	Green Sunfish	(GSF)	08/25/93	Metals
Sonoma Creek*	Hitch	(HCH)	08/24/93	Metals
Suisun Bay	White Sturgeon	(WST)	02/19/93	Metals
Walker Creek	Rainbow Trout	(RBT)	08/25/93	Metals
Walnut Creek	Green Sunfish	(GSF)	08/26/93	Metals
<u>Region 3</u>				
BLM Reservoir/Buena Vista Mine*	Bluegill	(BG)	08/10/93	Metals
Klau Mine Pond*	Bluegill	(BG)	08/10/93	Metals
Lake Nacimiento/Las Tablas	Largemouth Bass	(LMB)	08/12/93	Metals
Oso Flaco Lake*	Bluegill	(BG)	08/12/93	Metals, Organics
	Bluegill	(BG)	08/12/93	Metals, Organics
Small Twin Lake*	Largemouth Bass	(LMB)	08/12/93	Metals, Organics
	Largemouth Bass	(LMB)	08/12/93	Metals, Organics
<u>Region 4</u>				
Arroyo Conejo/d/s Forks*	Black Bullhead	(BLB)	06/23/93	Metals, Organics
Ballona Creek*	Striped Mullet	(MUL)	06/22/93	Metals, Organics
Ballona Wetlands*	Longjaw Mudsucker	(LJM)	06/19/93	Metals, Organics
Calleguas Creek	Fathead Minnow	(FHM)	06/20/93	Organics
Harbor Park Lake	Carp	(CP)	06/19/93	Organics
Malibu Lagoon*	Pacific Staghorn Sculpin	(STG)	06/22/93	Metals, Organics
Marina del Rey*	White Croaker	(WCK)	06/22/93	Metals, Organics
Mugu Lagoon	Gray Smoothhound Shark	(GSS)	06/23/93	Metals, Organics
Oxnard Drainage Ditch 2*	Goldfish	(GF)	06/23/93	Organics
Revolon Slough	Fathead Minnow	(FHM)	06/20/93	Organics

* Stations sampled for the first time in 1993.

TABLE 2 (continued)
1993 Toxic Substances Monitoring Program

Station Name	Sample		Collection Date	Analyses
Rio de Santa Clara/Oxnard Drain	Sediment	(SED)	06/23/93	Organics
San Gabriel River	Mozambique Tilapia	(TLM)	05/20/93	Metals, Organics
Simms Pond*	Black Bullhead	(BLB)	05/20/93	Metals, Organics
Ventura River Estuary*	Shiner Perch	(SSP)	06/21/93	Metals, Organics
Ventura River/Ojai*	Arroyo Chub	(AC)	06/21/93	Metals, Organics
<u>Region 5</u>				
American River/d/s Watt Avenue Bridge	Largemouth Bass	(LMB)	11/05/93	Metals
Feather River/d/s Highway 99 Bridge	Channel Catfish	(CCF)	10/26/93	Metals
Kern River/Bakersfield	Largemouth Bass	(LMB)	09/01/93	As
Lake Kaweah	Largemouth Bass	(LMB)	09/01/93	Metals
Mud Slough	White Catfish	(WCF)	10/28/93	Se
Sacramento River/Hood	Channel Catfish	(CCF)	11/17/93	Metals, Organics
	White Catfish	(WCF)	11/17/93	Metals, Organics
Sacramento River/Keswick	Rainbow Trout	(RBT)	10/14/93	Metals
Salt Slough	White Catfish	(WCF)	10/27/93	Se
San Joaquin River/Mossdale	Bluegill	(BG)	11/16/93	Metals, Organics
	Largemouth Bass	(LMB)	11/16/93	Metals, Organics
<u>Region 6</u>				
Donner Lake	Lake Trout	(LT)	09/16/93	PCBs
	Sediment	(SED)	09/16/93	Organics
Haiwee Reservoir	Largemouth Bass	(LMB)	09/23/93	Metals
June Lake	Tui Chub	(TC)	09/22/93	Hg
McGee Creek	Brown Trout	(BN)	09/22/93	Metals
Trout Creek/Tahoe/d/s Meeks Lumber*	Brown Trout	(BN)	10/22/93	Metals, Organics
	Sucker	(SKR)	10/22/93	Metals, Organics
Trout Creek/Tahoe/u/s Meeks Lumber*	Brown Trout	(BN)	10/22/93	Metals, Organics
Trout Creek/Truckee/d/s Meeks Lumber	Rainbow Trout	(RBT)	09/16/93	Metals
Trout Creek/Truckee/u/s Meeks Lumber	Rainbow Trout	(RBT)	09/16/93	Metals
<u>Region 7</u>				
Alamo River/Brawley*	Channel Catfish	(CCF)	09/30/93	Metals, Organics
Alamo River/Calipatria	Carp	(CP)	09/29/93	As,Cd,Hg,Ni,Se,
	Organics			
Alamo River/Holtville*	Carp	(CP)	09/30/93	As,Cd,Hg,Ni,Se,
	Organics			
New River/International Boundary	Carp	(CP)	06/16/93	As,Cd,Hg,Ni,Se,
	Organics			
New River/Westmorland	Channel Catfish	(CCF)	09/29/93	Metals, Organics
Peach Drain	Sediment	(SED)	09/30/93	Metals, Organics

* Stations sampled for the first time in 1993.

TABLE 2 (continued)
1993 Toxic Substances Monitoring Program

Station Name	Sample		Collection Date	Analyses
<u>Region 8</u>				
Anza Channel	Fathead Minnow	(FHM)	05/18/93	Metals
Huntington Harbour/Anaheim Bay	Barred Surfperch	(BSP)	06/18/93	Metals, Organics
Peters Canyon Channel	Red Shiner	(PRS)	05/19/93	Metals, Organics
San Diego Creek/Barranca Parkway	Red Shiner	(PRS)	05/19/93	Organics
San Diego Creek/Michelson Drive	Red Shiner	(PRS)	05/19/93	Metals, Organics
San Diego Creek/Upper Newport Bay	California Killifish	(CKF)	05/19/93	Organics
	California Killifish	(CKF)	05/19/93	Organics
Santa Ana River/Imperial Highway Bridge	Santa Ana Sucker	(SAK)	05/18/93	Metals, Organics
Santa Ana River/Prado Dam	Black Bullhead	(BLB)	05/18/93	Metals, Organics
<u>Region 9</u>				
Famosa Slough	Longjaw Mudsucker	(LJM)	06/16/93	Metals, Organics
Lake San Marcos*	Largemouth Bass	(LMB)	06/17/93	Metals, Organics
Lindo Lake*	Golden Shiner	(GSH)	12/06/93	Metals, Organics
Los Penasquitos Creek/Highway 15*	Green Sunfish	(GSF)	06/15/93	Metals, Organics
Rainbow Creek/Highway 15*	Mosquitofish	(GAM)	06/15/93	Organics
San Dieguito Lagoon	Pacific Staghorn Sculpin	(STG)	06/16/93	As
San Juan Creek/Doheny State Park*	Red Shiner	(PRS)	06/17/93	Metals, Organics
San Marcos Creek/Gibraltar*	Bluegill	(BG)	06/16/93	Metals, Organics

* Stations sampled for the first time in 1993.

TABLE 3
 Toxic Substances Monitoring Program
 1992-93 Freshwater Fish Code List *

Species Code	Common Name	Species Name	Family Name
AC	Arroyo Chub	<i>Gila orcutti</i>	Cyprinidae
BG	Bluegill	<i>Lepomis macrochirus</i>	Centrarchidae
BLB	Black Bullhead	<i>Ameiurus melas</i>	Ictaluridae
BN	Brown Trout	<i>Salmo trutta</i>	Salmonidae
CCF	Channel Catfish	<i>Ictalurus punctatus</i>	Ictaluridae
CKF	California Killifish	<i>Fundulus parvipinnis</i>	Cyprinodontidae
CP	Carp	<i>Cyprinus carpio</i>	Cyprinidae
DC	Speckled Dace	<i>Rhinichthys osculus</i>	Cyprinidae
FCF	Flathead Catfish	<i>Pylodictis olivaris</i>	Ictaluridae
FHM	Fathead Minnow	<i>Pimephales promelas</i>	Cyprinidae
GAM	Mosquitofish	<i>Gambusia affinis</i>	Poeciliidae
GF	Goldfish	<i>Carassius auratus</i>	Cyprinidae
GSF	Green Sunfish	<i>Lepomis cyanellus</i>	Centrarchidae
GSH	Golden Shiner	<i>Notemigonus crysoleucas</i>	Cyprinidae
HCH	Hitch	<i>Lavinia exilicauda</i>	Cyprinidae
LCT	Lahontan Cutthroat Trout	<i>Oncorhynchus clarki henshawi</i>	Salmonidae
LJM	Longjaw Mudsucker	<i>Gillichthys mirabilis</i>	Gobiidae
LMB	Largemouth Bass	<i>Micropterus salmoides</i>	Centrarchidae
LT	Lake Trout ##	<i>Salvelinus namaycush</i>	Salmonidae
MOL	Sailfin Molly	<i>Poecilia latipinna</i>	Poeciliidae
PCP	Prickly Sculpin	<i>Cottus asper</i>	Cottidae
PRS	Red Shiner	<i>Cyprinella lutrensis</i>	Cyprinidae
RBT	Rainbow Trout	<i>Oncorhynchus mykiss</i>	Salmonidae
RCP	Riffle Sculpin #	<i>Cottus gulosus</i>	Cottidae
RSF	Redear Sunfish	<i>Lepomis microlophus</i>	Centrarchidae
SAKR	Santa Ana Sucker	<i>Catostomus santaanae</i>	Catostomidae
SH	Steelhead Rainbow Trout	<i>Oncorhynchus mykiss gairdneri</i>	Salmonidae
SKR	Sucker	<i>Catostomus sp.</i>	Catostomidae
SMB	Smallmouth Bass	<i>Micropterus dolomieu</i>	Centrarchidae
SP	Sacramento Perch	<i>Archoplites interruptus</i>	Centrarchidae
SQF	Sacramento Squawfish	<i>Ptychocheilus grandis</i>	Cyprinidae
STB	Threespine Stickleback	<i>Gasterosteus aculeatus</i>	Gasterosteidae
STG	Pacific Staghorn Sculpin	<i>Leptocottus armatus</i>	Cottidae

* Common and scientific fish names were obtained from Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott. 1991. Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 20, Bethesda, Maryland.

Collected for the first time in 1992.

Collected for the first time in 1993.

TABLE 3 (continued)
 Toxic Substances Monitoring Program
 1992-93 Freshwater Fish Code List *

Species Code	Common Name	Species Name	Family Name
TC	Tui Chub	<i>Gila bicolor</i>	Cyprinidae
TLM	Mozambique Tilapia	<i>Tilapia mossambica</i>	Cichlidae
TLZ	Redbelly Tilapia	<i>Tilapia zillii</i>	Cichlidae
WCF	White Catfish	<i>Ameiurus catus</i>	Ictaluridae
WCR	White Crappie	<i>Pomoxis annularis</i>	Centrarchidae
WST	White Sturgeon	<i>Acipenser transmontanus</i>	Acipenseridae
YB	Yellow Bullhead	<i>Ameiurus natalis</i>	Ictaluridae
YFG	Yellowfin Goby	<i>Acanthogobius flavimanus</i>	Gobiidae

* Common and scientific fish names were obtained from Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott. 1991. Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 20, Bethesda, Maryland.

TABLE 4
 Toxic Substances Monitoring Program
 1992-93 Marine Fish Code List*

Species Code	Common Name	Species Name	Family Name
BP	Black Perch #	<i>Embiotoca jacksoni</i>	Embiotocidae
BSP	Barred Surfperch ##	<i>Amphistichus argenteus</i>	Embiotocidae
GSS	Gray Smoothhound Shark	<i>Mustelus californicus</i>	Carcharhinidae
MUL	Striped Mullet	<i>Mugil cephalus</i>	Mugilidae
SSP	Shiner Perch	<i>Cymatogaster aggregata</i>	Embiotocidae
STF	Starry Flounder	<i>Platichthys stellatus</i>	Pleuronectidae
WCK	White Croaker	<i>Genyonemus lineatus</i>	Sciaenidae
YFC	Yellowfin Croaker #	<i>Umbrina roncador</i>	Sciaenidae

* Common and scientific fish names were obtained from Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott. 1991. Common and Scientific Names of Fishes from the United States and Canada. American Fisheries Society Special Publication 20, Bethesda, Maryland.

Collected for the first time in 1992.

Collected for the first time in 1993.

TABLE 5
 Toxic Substances Monitoring Program
 1992-93 Non-Fish Code List

Species Code	Common Name	Species Name	Family Name
SST	Spiny Soft Shelled Turtle	<i>Trionyx spiniferus</i>	Trionychidae

2. FIELD AND LABORATORY OPERATIONS

The presence of many toxic substances in fresh waters is determined by analyzing tissues from fish and other aquatic organisms. Concentrations of these substances in water are often too low or transitory to be reliably detected through the more traditional methods of analysis of water samples. Also, many toxic substances are not water soluble, but can be found associated with sediment or organic matter. Fish and other aquatic organisms are sampled because they bioaccumulate and bioconcentrate toxic substances to levels which may be many hundreds of times the levels actually in the water. This concentration factor facilitates detection of toxic pollutants. The following is a general overall discussion of field and laboratory procedures. A detailed discussion is provided in Appendix S.

Substances Measured

A total of 10 trace elements (metals) and approximately 45 pesticides and PCBs (organic chemicals) are analyzed in the TSMP on a regular basis. Additional substances, such as polynuclear aromatic hydrocarbons (PAHs), pentachlorophenol (PCP), and tetrachlorophenol (TCP), are looked for on a request basis only. Not every sample is analyzed for all metals or organic chemicals. Each sample at each station is handled individually. The requesting agency, usually the RWQCBs, will specify the type of analysis for each sample. Starting in 1993, the trace elements arsenic, cadmium, nickel, mercury, and selenium are routinely analyzed in filet tissue. Previously, only mercury and selenium were routinely analyzed in filet tissue. All other metals are analyzed in the liver. This change was brought about by the development of MTRs for arsenic, cadmium, and nickel which are measured in edible (filet) tissue. All organic chemicals have historically been analyzed in filet or muscle tissue. When only very small fish are available, metal or organic chemical analysis is performed on a whole-body composite of larger than usual numbers of individual fish.

Sample Size

Composite samples, using six fish of each species, are collected whenever possible. The number and size uniformity of the fish in each composite depends upon their availability. Replicate composites are collected and analyzed to measure the variability of toxicant concentrations in single species composites collected at the same time and place. Collection of the same species from all stations is desirable to minimize possible variation in the data due to differences in pollutant uptake between species. However, this is not possible over the entire State due to the variety of habitat sampled and limited collection time available in the program. All reasonable efforts are made to maintain both station-to-station and year-to-year uniformity in collections.

Wet and Lipid Weight Measurements

Tissue concentrations of metals and organic chemicals are measured on a wet weight basis. Metal data are presented in parts per million (ppm), while organic chemical data are presented in parts per billion (ppb).

In addition to wet weight measures, organic chemicals are also expressed on a lipid weight basis. Lipid weight measurements offer several advantages. Because chlorinated hydrocarbons are much more soluble in lipids (fat tissues) than in water, they partition into lipid-rich tissues of aquatic organisms (Stout and Beezhold 1981). Animals with higher proportions of lipid in their tissue usually have had higher concentrations of chlorinated hydrocarbon pollutants (Phillips 1980). Factors such as season, water temperature, health of the organism, stress on the organism, and type of species can affect the lipid levels of samples collected for analysis and can, therefore, cause variability in results. Use of lipid weight measurements may reduce this source of variability, although disadvantages have also been noted (Phillips 1980). As a result, lipid weight values may represent a more realistic measure of environmental availability of chlorinated hydrocarbons than wet weight values. Wet weight measures, however, remain the preferred measure for most readers because all standards for human health and for predator protection are based on wet weight measures. Also, wet weight measures better reflect the exposure of predators or humans to the actual concentration in freshly caught fish.

Station Numbers

Each TSMP station is identified by a unique seven digit number derived from the SWRCBs hydrologic basin planning maps. The first digit of a station number signifies one of the nine RWQCBs. The second and third digits represent a hydrologic area, while the fourth and fifth digits identify a hydrologic subarea. The sixth and seventh digits represent the distance in miles above the downstream hydrologic boundary. For example, station 519.21.01 is in Region 5, hydrologic area 19, subarea 21, and is one mile upstream from the hydrologic unit boundary. Not all mileage indicators are accurate, however. In certain instances, it was necessary to assign an arbitrary mileage indicator. For example, the arbitrary designation is used when two or more stations within the same hydrologic subarea are located within the same number of miles of the hydrologic boundary, resulting in the same station number. In this case, one or more of the stations is arbitrarily assigned a mileage designator from 90 to 99.

3. ADMINISTRATIVE AND COMPARATIVE CRITERIA

In this report, as in previous TSMP reports, the term "criteria" is used to refer to the criteria against which a particular metal or organic chemical is being compared. As more than one criterion may apply to any one metal or organic compound, a hierarchy was established. The intent of the hierarchy is to compare data against the more important criterion. In general, FDA action levels and the "Median International Standards" (MIS), human health-related criteria, are considered more important or critical. Following human health criteria are NAS guidelines, predator protection criteria. Last in the hierarchy are "elevated data levels" (EDL). Maximum Tissue Residue Levels (MTRLs), a relatively new human health related criteria, are considered separately. All appropriate 1992-93 data are compared to MTRLs in addition to following the usual hierarchy. The criteria mentioned above are discussed below.

In interpreting the TSMP data by any of the criteria provided, the reader is cautioned that there is no simple relationship between concentrations of toxic substances observed in tissue samples and actual concentrations in water. Different aquatic organisms tend to bioaccumulate a given toxic substance in water to different levels; however, the differences usually do not prevent a general interpretation of the data. The reader is also cautioned that the limited number of samples obtained and analyzed at each station in a single year is generally too small to provide a statistically sound basis for making absolute statements on toxic substance concentrations. The values reported herein should be accepted as indicators of relative levels of toxic pollution in water, not as absolute values. In this sense, trends over time and ranking values of a toxic substance in a particular species provide only an indication of areas where fish are evidently accumulating concentrations which are above "normal".

Maximum Tissue Residue Levels (MTRLs)

MTRLs were developed by SWRCB staff from human health water quality objectives in the *Draft November 26, 1990 Functional Equivalent Document - Development of Water Quality Plans For: Inland Surface Waters of California and Enclosed Bays and Estuaries of California* (SWRCB 1990a), the *Draft April 9, 1991 Supplement to the Functional Equivalent Document* (SWRCB 1991), and the *1990 California Ocean Plan* (SWRCB 1990b). The objectives represent concentrations in water that protect against consumption of fish, shellfish, and water (freshwater only) that contain substances at levels which could result in significant human health problems. MTRLs are used as alert levels or guidelines indicating water bodies with potential human health concerns and are an assessment tool and not compliance or enforcement criteria. MTRLs are compared only to file or edible tissue samples and should not be compared to whole body or liver samples. Tables 6 and 7 list freshwater and marine MTRLs for those substances monitored in the TSMP. The MTRLs for many of the carcinogens listed in Table 6 and 7 are below the current tissue detection limit for those substances (see Appendix S for detection limits).

The MTRLs were calculated by multiplying the human health water quality objectives by the bioconcentration factor (BCF) for each substance as recommended in the USEPA *Draft Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991). BCFs were taken from the USEPA 1980 Ambient Water Quality Criteria Documents for each substance. MTRLs were not calculated for objectives that are based on maximum contaminant levels (MCLs) or taste and odor criteria.

FDA Action Levels and NAS Guidelines

The U.S. Food and Drug Administration (FDA) has established maximum concentration levels for some toxic substances in human foods (USFDA 1985). The levels are based on specific assumptions of the quantities of food consumed by humans and upon the frequency of their consumption. The FDA limits are intended to protect humans from the chronic effects of toxic substances consumed in foodstuffs. The National Academy of Sciences (NAS) has established recommended maximum concentrations of toxic substance concentrations in freshwater fish tissue (NAS 1973). They were established not only to protect the organisms containing the toxic compounds, but also to protect the species that consume these contaminated organisms. The specific action levels and guidelines used in this report are shown in Table 8 at the end of this section.

Median International Standards (MIS) for Trace Elements

The Food and Agriculture Organization of the United Nations has published a survey of health protection criteria used by member nations (Nauen 1983). These criteria vary somewhat in the tissues to be analyzed or the level of protection desired, but may be compared qualitatively. Table 9 at the end of this section summarizes these standards as an indication of what other countries have determined to be unsafe levels of trace elements. Though the standards do not apply within the United States, they provide an indication of what other nations consider to be an elevated concentration of trace elements in fish tissues. Even so, the reader is reminded that most TSMP metal analyses are done in liver, rather than in edible portions. Measurements in liver should not be compared to Median International Standards. A description of how the Median International Standards were compiled by SWRCB staff is provided in Appendix T.

Elevated Data Levels

The "elevated data level" (EDL) was introduced by SWRCB staff in 1983 as an internal comparative measure which ranks a given concentration of a particular substance with previous data from the TSMP. The EDL is calculated by ranking all of the results for a given chemical from the highest concentration measured down to and including those records where the chemical was not detected. From this, a cumulative distribution is constructed and percentile rankings are calculated. For example, the 50th percentile corresponds to the median or "middle" value rather than to the mean. With a large number of records, the median can be approximately compared to the mean.

Starting in 1990, EDL calculations were modified to reflect the growing number of marine species analyzed in the TSMP. In the past, EDL calculations for wet weight measures were grouped by similar tissue types, such as filet or whole-body samples. In 1990, the EDL calculations were further split into freshwater and marine fish types. Now when any sample is compared to an EDL, it is compared to the EDL calculated from the same fish and tissue types (i.e. freshwater fish filets are compared only to other freshwater fish filets, etc.). The substance most affected by the change in the EDL calculations was arsenic. The EDL criteria for arsenic in freshwater fish livers and whole samples were lowered by approximately half from 1978-1989 calculations. A separate copper EDL is calculated for salmonid liver tissue because trout are known to accumulate copper to higher levels than other species. White bass also seem to accumulate copper and other trace elements to higher levels. Starting in 1988, white bass are not included in the EDL calculations. White bass are found only in a few locations in California and further sampling of this species

will be avoided whenever possible. In calculating the EDLs for lipid weight measures of organic chemicals, all tissue types are combined because lipid weight measures in different tissue types tend to be far more similar than wet weight measures (Phillips 1980). However, like wet weight measures, EDL lipid weight calculations were also split into freshwater and marine fish types. The 1978-1993 EDLs and the number of data points used to calculate each EDL are provided in Tables 10 through 18 at the end of this section.

The 85th percentile (EDL 85) was chosen as an indication that a chemical is elevated from the median. The 85th percentile corresponds to measures used by the U.S. Fish and Wildlife Service in their National Contaminant Biomonitoring Program and would represent approximately one and one-half standard deviations from the mean, if the data were normally distributed. The 95th percentile (EDL 95) was chosen to indicate values that are highly elevated above the median. The 95th percentile would represent two standard deviations from the mean, if the data were normally distributed. When used along with other information, these measures provide a useful guideline to determine if a chemical has been found in unusually high concentrations. A more detailed description of EDL rankings is provided in Appendix U. The reader is again cautioned that EDLs are not directly related to potentially adverse human or animal health effects; they are only a way to compare findings in a particular area with the larger data base of findings from all over the state.

TABLE 6
Toxic Substances Monitoring Program

Maximum Tissue Residue Levels (MTRLs) for Carcinogens in Inland Surface Waters

Substance	Water Quality Objective ^a (µg/l)	BCF ^b (l/kg)	MTRL ^c (µg/kg, ppb)
aldrin	0.00013	d	0.05
arsenic	5.0 ^e	44	200.0 (0.2 ppm)
chlordane (total)	0.00008	14100	1.1
DDT (total)	0.00059	53600	32.0
dieldrin	0.00014	4670	0.65
heptachlor	0.00016	11200	1.8
heptachlor epoxide	0.00007	11200	0.8
hexachlorobenzene (HCB)	0.00066	8690	6.0
hexachlorocyclohexane (HCH), alpha	0.0039	130	0.5
hexachlorocyclohexane (HCH), beta	0.014	130	1.8
hexachlorocyclohexane (HCH), gamma	0.019	130	2.5
PAHs (total)	0.0028	30	0.08
PCBs (total)	0.00007	31200	2.2
pentachlorophenol (PCP)	0.28	11	3.1
toxaphene	0.00067	13100	8.8

Maximum Tissue Residue Levels (MTRLs) for Non-carcinogens in Inland Surface Waters

Substance	Water Quality Objective ^a (mg/l)	BCF ^b (l/kg)	MTRL ^c (mg/kg, ppm)
cadmium	0.01	64	0.64
endosulfan (total)	0.0009	270	0.25 (250 ppb)
endrin	0.0008	3970	3.0 (3,000 ppb)
mercury	0.000012	f	1.0
nickel	0.6	47	28.0

- From Draft November 26, 1990 Functional Equivalent Document - Development of Water Quality Plans For: Inland Surface Waters of California and Enclosed Bays and Estuaries of California (SWRCB 1990a) and the Draft April 9, 1991 Supplement to the Functional Equivalent Document (SWRCB 1991). MTRLs were not developed for objectives based on maximum contaminant levels (MCLs) or taste and odor criteria.
- Bioconcentration Factors taken from the USEPA 1980 Ambient Water Quality Criteria Documents for each substance.
- MTRLs were calculated by multiplying the Water Quality Objective by the BCF, except for aldrin, arsenic, and mercury.
- Aldrin MTRL is derived from a combination of aldrin and dieldrin risk factors and BCFs as recommended in the USEPA 1980 "Ambient Water Quality Criteria for Aldrin/Dieldrin" (USEPA 1980).
- Arsenic MTRL was calculated from the formula $NSRL \div (WI/BCF) + FC = MTRL$. [NSRL (California's No Significant Risk Level for arsenic) = 10 µg/d, WI (Water Intake) = 2 l/d, FC (daily fish consumption) = 0.0065 kg/d].
- The MTRL for mercury is the FDA action level. The water quality objective for mercury in the Inland Surface Waters Plan is based on the FDA action level as recommended in the USEPA 1985 "Ambient Water Quality Criteria for Mercury" (USEPA 1985).

TABLE 7
Toxic Substances Monitoring Program

Maximum Tissue Residue Levels (MTRLs) for Carcinogens in Ocean Waters ^a

Substance	Water Quality Objective ^b (µg/l)	BCF ^c (l/kg)	MTRL ^d (µg/kg, ppb wet weight)
aldrin	0.000022	e	0.1
chlordane (total)	0.000023	14100	0.32
DDT (total)	0.00017	53600	9.1
dieldrin	0.00004	4670	0.2
heptachlor	0.00072	11200	8.1
hexachlorobenzene (HCB)	0.00021	8690	2.0
PCBs (total)	0.000019	31200	0.6
toxaphene	0.00021	13100	2.75

- a. The TSMP does not analyze for any of the non-carcinogens listed in the human health section of Table B of the 1990 Ocean Plan.
- b. From Table B, Objectives for Human Health, "California Ocean Plan" (SWRCB 1990).
- c. Bioconcentration Factors taken from the USEPA 1980 Ambient Water Quality Criteria Documents for each substance.
- d. MTRLs were calculated by multiplying the Water Quality Objective by the BCF, except for aldrin.
- e. Aldrin MTRL is derived from a combination of aldrin and dieldrin risk factors and BCFs as recommended in the USEPA 1980 "Ambient Water Quality Criteria for Aldrin/Dieldrin" (USEPA 1980).

TABLE 8
 NAS Guidelines and FDA Action Levels for Toxic Chemicals in Fish
 (wet weight)

Chemical	NAS ^a		FDA ^b	
	Recommended Guideline for Freshwater Fish		Action Level for Freshwater and Marine Fish	
	(Whole Fish)		(Edible Portion)	
	ug/g (ppm)	ng/g (ppb)	ug/g (ppm)	ng/g (ppb)
Mercury	0.5	500	1.0 ^d	1,000
DDT (total)	1.0	1,000	5.0	5,000
PCB (total)	0.5	500	2.0 ^e	2,000
aldrin	0.1 ^c	100	0.3	300
dieldrin	0.1 ^c	100	0.3	300
endrin	0.1 ^c	100	0.3	300
heptachlor	0.1 ^c	100	0.3	300
heptachlor epoxide	0.1 ^c	100	0.3	300
chlordane (total)	0.1 ^c	100	0.3	300
lindane	0.1	100	-	-
hexachlorocyclo- hexane (total)	0.1 ^c	100	-	-
endosulfan (total)	0.1 ^c	100	-	-
toxaphene	0.1 ^c	100	5.0	5,000

- a National Academy of Sciences-National Academy of Engineering. 1973. Water Quality Criteria, 1972 (Blue Book). U.S. Environmental Protection Agency, Ecological Research Series.
- b U. S. Food and Drug Administration. 1984. Shellfish Sanitation Interpretation: Action Levels for Chemical and Poisonous Substances, June 21, 1984. U.S.F.D.A., Shellfish Sanitation Branch, Washington, D.C.
- c Individually or in combination. Chemicals in this group under NAS Guidelines are referred to as Chemical Group A in this report.
- d As methyl mercury.
- e A tolerance, rather than an action level, has been established for PCBs (21CFR 109, published May 29, 1984). An action level is revoked when a regulation establishes a tolerance for the same substance and use.

TABLE 9
 Median International Standards for Trace Elements
 in Freshwater Fish and Marine Shellfish ^a
 (edible portion, ppm, wet weight)

Element	Fish	Shellfish	Range	Number of Countries with Standards
Antimony	1.0	1.0	1.0 to 1.5	3
Arsenic	1.5	1.4	0.1 to 5.0	11
Cadmium	0.3	1.0	0.05 to 2.0	10
Chromium	1.0	1.0	1.0	1
Copper	20.0	20.0	10 to 100	8
Fluoride	150.0	-	150.0	1
Fluorine	17.5	-	10 to 25	2
Lead	2.0	2.0	0.5 to 10.0	19
Mercury	0.5	0.5	0.1 to 1.0	28
Selenium	2.0	0.3	0.3 to 2.0	3
Tin	150.0	190.0	50 to 250	8
Zinc	45.0	70.0	40 to 100	6

a Based on: Nauen, C. C., Compilation of Legal Limits for Hazardous Substances in Fish and Fishery Products, Food and Agriculture Organization of the United Nations, 1983.

TABLE 10. TSMP EDL 85 AND EDL 95 for Trace Elements in Fish Livers
 Calculated Using 1978 - 1993 Data.
 (ppm, wet weight)

Freshwater Fish

Element	Fish Type*	EDL 85	EDL 95	Number of Samples
Arsenic	All	0.21	0.68	555
Cadmium	All	0.36	0.99	569
Chromium	All	0.03	0.07	585
Copper	Non	13.00	32.00	468
Copper	Salmo	166.00	230.00	136
Lead	All	0.10	0.20	583
Mercury	All	ID	ID	9
Nickel	All	<0.10	0.20	553
Selenium	All	3.32	4.74	112
Silver	All	0.25	0.72	587
Zinc	All	28.00	38.00	585

Marine Fish

Element	EDL 85	EDL 95	Number of Samples
Arsenic	7.03	17.23	35
Cadmium	1.10	3.26	36
Chromium	<0.02	0.03	39
Copper	22.85	30.80	41
Lead	0.20	0.60	40
Mercury	ID	ID	0
Nickel	<0.10	0.13	35
Selenium	ID	ID	5
Silver	0.70	2.30	41
Zinc	40.00	45.95	41

* Non = Includes all non-salmonid species.

Salmo = Salmonids.

All = All fish species.

< = EDL lies below the indicated detection limit.

ID = Insufficient number of data points to calculate the EDL.

TABLE 11. TSMP EDL 85 AND EDL 95 for Trace Elements in Whole Fish
 Calculated Using 1978 - 1993 Data.
 (ppm, wet weight)

Freshwater Fish

Element	EDL 85	EDL 95	Number of Samples
Arsenic	0.44	0.92	146
Cadmium	0.08	0.15	146
Chromium	0.23	0.48	146
Copper	3.40	4.34	146
Lead	0.20	0.50	146
Mercury	0.10	0.19	147
Nickel	0.20	0.56	147
Selenium	1.40	1.86	167
Silver	0.03	0.05	146
Zinc	40.00	49.00	146

Marine Fish

Element	EDL 85	EDL 95	Number of Samples
Arsenic	ID	ID	3
Cadmium	ID	ID	3
Chromium	ID	ID	3
Copper	ID	ID	5
Lead	ID	ID	3
Mercury	ID	ID	5
Nickel	ID	ID	3
Selenium	ID	ID	3
Silver	ID	ID	3
Zinc	ID	ID	3

ID = Insufficient number of data points to calculate the EDL.

TABLE 12. TSMP EDL 85 AND EDL 95 for Trace Elements in Fish Filets
 Calculated Using 1978 - 1993 Data.
 (ppm, wet weight)

Freshwater Fish

Element	EDL 85	EDL 95	Number of Samples
Arsenic	0.14	0.30	83
Cadmium	<0.01	<0.01	67
Chromium	<0.02	<0.02	25
Copper	0.68	0.73	25
Lead	<0.10	<0.10	25
Mercury	0.80	1.70	1187
Nickel	<0.10	<0.10	67
Selenium	1.10	1.84	492
Silver	<0.02	<0.02	25
Zinc	16.50	30.25	25

Marine Fish

Element	EDL 85	EDL 95	Number of Samples
Arsenic	ID	ID	7
Cadmium	ID	ID	6
Chromium	ID	ID	1
Copper	ID	ID	1
Lead	ID	ID	1
Mercury	0.15	0.55	43
Nickel	ID	ID	6
Selenium	3.40	3.85	55
Silver	ID	ID	1
Zinc	ID	ID	1

< = EDL lies below the indicated detection limit.

ID = Insufficient number of data points to calculate the EDL.

TABLE 13
 TSMP EDL 85 AND EDL 95 For Organic Chemicals in Freshwater Fish Filets
 Calculated Using 1978 - 1993 Data.
 (ppb, wet weight)

Chemical	EDL 85	EDL 95	Number of Samples
Aldrin	<5.0	<5.0	751
Chemical Group A	400.6	1223.8	771
Chlordene, Alpha	<5.0	<5.0	647
Chlordene, Gamma	<2.0	<2.0	647
Cis-chlordane	12.0	38.0	756
Cis-nonachlor	6.0	18.0	647
Oxychlordane	<5.0	<5.0	755
Trans-chlordane	7.8	21.0	756
Trans-nonachlor	18.0	44.0	727
Total Chlordane	41.6	119.8	756
Chlorpyrifos	<10.0	19.0	751
Dacthal	12.5	340.0	757
Diazinon	<50.0	<50.0	732
DDD, o,p'	11.0	36.0	756
DDD, p,p'	84.6	250.0	756
DDE, o,p'	<10.0	24.2	756
DDE, p,p'	570.0	2000.0	757
DDMS, p,p'	<30.0	<30.0	637
DDMU, p,p'	<5.0	39.6	756
DDT, o,p'	<10.0	17.3	754
DDT, p,p'	28.0	112.0	756
Total DDT	758.2	2467.6	757
Dicofol (Kelthane)	<100.0	<100.0	751
Dichlorobenzophenone, p,p'	ID	ID	6
Dieldrin	10.0	35.2	738
Endosulfan I	<5.0	23.9	742
Endosulfan II	<70.0	83.8	286
Endosulfan sulfate	<85.0	120.0	286
Total Endosulfan	*	52.0	742
Endrin	<15.0	<15.0	754
Ethion	<20.0	<20.0	753
HCH, Alpha	<2.0	<2.0	754
HCH, Beta	<10.0	<10.0	754
HCH, Delta	<5.0	<5.0	754
HCH, Gamma (Lindane)	<2.0	3.0	754
Total HCH	*	4.3	754
Heptachlor	<5.0	<5.0	751
Heptachlor Epoxide	<5.0	<5.0	751
Hexachlorobenzene	<2.0	5.4	754
Methoxychlor	<15.0	<15.0	749
Oxadiazon	<5.0	9.7	221
Parathion, Ethyl	<10.0	<10.0	732
Parathion, Methyl	<10.0	<10.0	732
PCB-1248	<50.0	<50.0	787
PCB-1254	<50.0	156.5	787
PCB-1260	60.0	180.0	787
Total PCB	120.0	350.0	787
Pentachlorophenol	2.8	4.9	21
2,3,5,6-tetrachlorophenol	<2.0	<0.004	21
Toxaphene	246.5	1000.0	769

< = EDL lies below the indicated detection limit.
 ID = Insufficient number of data points to calculate the EDL.
 * = EDL lies below the detection limit.

TABLE 14
 TSMP EDL 85 AND EDL 95 For Organic Chemicals in Marine Fish Filets
 Calculated Using 1978 - 1993 Data.
 (ppb, wet weight)

Chemical	EDL 85	EDL 95	Number of Samples
Aldrin	<5.0	<5.0	48
Chemical Group A	48.3	140.4	48
Chlordene, Alpha	<5.0	<5.0	47
Chlordene, Gamma	<5.0	<5.0	47
Cis-chlordane	10.0	30.8	48
Cis-nonachlor	<5.0	24.0	47
Oxychlordane	<5.0	<5.0	48
Trans-chlordane	6.0	15.2	48
Trans-nonachlor	15.0	43.8	48
Total Chlordane	37.9	124.4	48
Chlorpyrifos	<10.0	<10.0	48
Dacthal	16.6	30.0	48
Diazinon	<50.0	<50.0	48
DDD, o,p'	<10.0	<10.0	48
DDD, p,p'	27.6	73.2	48
DDE, o,p'	<10.0	<10.0	48
DDE, p,p'	252.0	526.0	48
DDMS, p,p'	<30.0	<30.0	29
DDMU, p,p'	<15.0	35.6	48
DDT, o,p'	<10.0	<10.0	48
DDT, p,p'	<10.0	30.8	48
Total DDT	268.8	632.0	48
Dicofol (Kelthane)	<100.0	<100.0	48
Dichlorobenzophenone, p,p'	ID	ID	0
Dieldrin	<5.0	6.7	48
Endosulfan I	<5.0	<5.0	43
Endosulfan II	<70.0	<70.0	26
Endosulfan sulfate	<85.0	<85.0	26
Total Endosulfan	*	*	43
Endrin	<15.0	<15.0	48
Ethion	<20.0	<20.0	48
HCH, Alpha	<2.0	2.0	48
HCH, Beta	<10.0	<10.0	48
HCH, Delta	<5.0	<5.0	48
HCH, Gamma (Lindane)	<2.0	3.3	48
Total HCH	*	4.3	48
Heptachlor	<5.0	<5.0	48
Heptachlor Epoxide	<5.0	<5.0	48
Hexachlorobenzene	<2.0	<2.0	48
Methoxychlor	<15.0	<15.0	48
Oxadiazon	<5.0	<5.0	27
Parathion, Ethyl	<10.0	<10.0	48
Parathion, Methyl	<10.0	<10.0	48
PCB-1248	<50.0	<50.0	48
PCB-1254	118.0	276.0	48
PCB-1260	98.2	206.0	48
Total PCB	246.4	514.0	48
Pentachlorophenol	ID	ID	0
2,3,5,6-tetrachlorophenol	ID	ID	0
Toxaphene	<100.0	<100.0	48

< = EDL lies below the indicated detection limit.
 ID = Insufficient number of data points to calculate the EDL.
 * = EDL lies below the detection limit.

TABLE 15
 TSMP EDL 85 AND EDL 95 For Organic Chemicals in Whole Freshwater Fish
 Calculated Using 1978 - 1993 Data.
 (ppb, wet weight)

Chemical	EDL 85	EDL 95	Number of Samples
Aldrin	<5.0	<5.0	172
Chemical Group A	1686.6	3498.7	172
Chlordene, Alpha	<5.0	5.1	172
Chlordene, Gamma	<5.0	9.9	172
Cis-chlordane	38.2	60.8	172
Cis-nonachlor	18.0	30.0	172
Oxychlordane	10.0	17.0	172
Trans-chlordane	22.0	38.2	172
Trans-nonachlor	50.0	69.8	172
Total Chlordane	144.8	204.8	172
Chlorpyrifos	26.2	73.6	172
Dacthal	95.6	426.0	172
Diazinon	<50.0	66.2	171
DDD, o,p'	50.2	162.0	172
DDD, p,p'	292.0	994.0	172
DDE, o,p'	17.0	48.0	172
DDE, p,p'	1800.0	3580.0	172
DDMS, p,p'	<30.0	<30.0	89
DDMU, p,p'	60.2	164.0	172
DDT, o,p'	50.2	146.0	172
DDT, p,p'	142.0	402.0	172
Total DDT	2479.2	5358.2	172
Dicofol (Kelthane)	<100.0	<100.0	172
Dichlorobenzophenone, p,p'	ID	ID	0
Dieldrin	49.4	473.5	171
Endosulfan I	8.6	51.0	159
Endosulfan II	<70.0	80.0	120
Endosulfan sulfate	95.0	240.0	120
Total Endosulfan	56.1	328.0	159
Endrin	<15.0	37.2	172
Ethion	<20.0	<20.0	172
HCH, Alpha	<2.0	<2.0	172
HCH, Beta	<10.0	<10.0	172
HCH, Delta	<5.0	<5.0	172
HCH, Gamma (Lindane)	3.3	9.1	172
Total HCH	4.0	9.6	172
Heptachlor	<5.0	<5.0	172
Heptachlor Epoxide	<5.0	11.4	172
Hexachlorobenzene	4.0	9.7	172
Methoxychlor	<15.0	<15.0	172
Oxadiazon	240.0	1140.0	106
Parathion, Ethyl	<10.0	<10.0	171
Parathion, Methyl	<10.0	<10.0	171
PCB-1248	<50.0	<50.0	173
PCB-1254	140.0	374.0	173
PCB-1260	82.2	160.0	173
Total PCB	240.0	600.6	173
Pentachlorophenol	ID	ID	5
2,3,5,6-tetrachlorophenol	ID	ID	5
Toxaphene	1100.0	2300.0	172

< = EDL lies below the indicated detection limit.

ID = Insufficient number of data points to calculate the EDL.

TABLE 16
 TSMP EDL 85 AND EDL 95 For Organic Chemicals in Whole Marine Fish
 Calculated Using 1978 - 1993 Data.
 (ppb, wet weight)

Chemical	EDL 85	EDL 95	Number of Samples
Aldrin	ID	ID	2
Chemical Group A	ID	ID	2
Chlordene, Alpha	ID	ID	2
Chlordene, Gamma	ID	ID	2
Cis-chlordane	ID	ID	2
Cis-nonachlor	ID	ID	2
Oxychlordane	ID	ID	2
Trans-chlordane	ID	ID	2
Trans-nonachlor	ID	ID	2
Total Chlordane	ID	ID	2
Chlorpyrifos	ID	ID	2
Dacthal	ID	ID	2
Diazinon	ID	ID	2
DDD, o,p'	ID	ID	2
DDD, p,p'	ID	ID	2
DDE, o,p'	ID	ID	2
DDE, p,p'	ID	ID	2
DDMS, p,p'	ID	ID	1
DDMU, p,p'	ID	ID	2
DDT, o,p'	ID	ID	2
DDT, p,p'	ID	ID	2
Total DDT	ID	ID	2
Dicofol (Kelthane)	ID	ID	2
Dichlorobenzophenone, p,p'	ID	ID	0
Dieldrin	ID	ID	2
Endosulfan I	ID	ID	2
Endosulfan II	ID	ID	2
Endosulfan sulfate	ID	ID	2
Total Endosulfan	ID	ID	2
Endrin	ID	ID	2
Ethion	ID	ID	2
HCH, Alpha	ID	ID	2
HCH, Beta	ID	ID	2
HCH, Delta	ID	ID	2
HCH, Gamma (Lindane)	ID	ID	2
Total HCH	ID	ID	2
Heptachlor	ID	ID	2
Heptachlor Epoxide	ID	ID	2
Hexachlorobenzene	ID	ID	2
Methoxychlor	ID	ID	2
Oxadiazon	ID	ID	1
Parathion, Ethyl	ID	ID	2
Parathion, Methyl	ID	ID	2
PCB-1248	ID	ID	2
PCB-1254	ID	ID	2
PCB-1260	ID	ID	2
Total PCB	ID	ID	2
Pentachlorophenol	ID	ID	0
2,3,5,6-tetrachlorophenol	ID	ID	0
Toxaphene	ID	ID	2

ID = Insufficient number of data points to calculate the EDL.

TABLE 17
 TSMP EDL 85 AND EDL 95 for Organic Chemicals in
 Filet and Whole Freshwater Fish
 Calculated Using 1980 - 1993 Lipid Data
 (ppb, lipid weight)

Chemical	EDL 85	EDL 95	Number of Samples
Aldrin	*	*	843
Chemical Group A	23359.5	85631.6	864
Chlordene, Alpha	*	*	816
Chlordene, Gamma	*	88.2	816
Cis-chlordane	840.1	2168.1	849
Cis-nonachlor	324.4	1030.3	816
Oxychlordane	*	221.5	849
Trans-chlordane	394.2	1186.4	849
Trans-nonachlor	1396.2	3623.7	849
Total Chlordane	3299.8	7613.6	849
Chlorpyrifos	*	1744.1	843
Dacthal	1322.1	20081.5	850
Diazinon	*	*	823
DDD, o,p'	592.1	2696.9	849
DDD, p,p'	5900.3	20272.2	849
DDE, o,p'	*	900.6	849
DDE, p,p'	48120.8	131504.0	850
DDMS, p,p'	*	*	647
DDMU, p,p'	330.5	2311.2	849
DDT, o,p'	*	1889.1	848
DDT, p,p'	604.4	5231.4	848
Total DDT	61167.6	164591.5	850
Dicofol (Kelthane)	*	*	843
Dichlorobenzophenone, p,p'	ID	ID	6
Dieldrin	705.9	3673.0	830
Endosulfan I	105.7	1582.3	822
Endosulfan II	*	1680.2	405
Endosulfan sulfate	*	7408.2	405
Total Endosulfan	235.3	5969.8	822
Endrin	*	*	847
Ethion	*	*	846
HCH, Alpha	*	*	847
HCH, Beta	*	*	847
HCH, Delta	*	*	847
HCH, Gamma (Lindane)	*	257.0	847
Total HCH	*	526.9	847
Heptachlor	*	*	843
Heptachlor Epoxide	*	*	843
Hexachlorobenzene	28.4	316.9	847
Methoxychlor	*	*	842
Oxadiazon	174.1	4227.8	328
Parathion, Ethyl	*	*	824
Parathion, Methyl	*	*	824
PCB-1248	*	*	879
PCB-1254	1656.7	9767.4	879
PCB-1260	1755.1	10886.8	879
Total PCB	6458.9	34903.2	879
Pentachlorophenol	242.8	353.6	20
2,3,5,6-tetrachlorophenol	*	231.2	20
Toxaphene	12583.9	66775.1	862

ID = Insufficient number of data points to calculate the EDL.
 * = EDL lies below the detection limit.

TABLE 18
 TSMP EDL 85 AND EDL 95 for Organic Chemicals in
 Filet and Whole Marine Fish
 Calculated Using 1980 - 1993 Lipid Data
 (ppb, lipid weight)

Chemical	EDL 85	EDL 95	Number of Samples
Aldrin	*	*	50
Chemical Group A	1509.5	9296.0	50
Chlordene, Alpha	*	*	49
Chlordene, Gamma	*	*	49
Cis-chlordane	376.5	757.0	50
Cis-nonachlor	*	794.7	49
Oxychlordane	*	*	50
Trans-chlordane	159.0	398.2	50
Trans-nonachlor	408.9	995.0	50
Total Chlordane	1122.7	2442.9	50
Chlorpyrifos	*	*	50
Dacthal	1604.0	2635.1	50
Diazinon	*	*	50
DDD, o,p'	*	687.9	50
DDD, p,p'	1315.2	7101.1	50
DDE, o,p'	*	*	50
DDE, p,p'	34375.0	127436.9	50
DDMS, p,p'	*	*	30
DDMU, p,p'	*	1175.4	50
DDT, o,p'	*	*	50
DDT, p,p'	*	367.1	50
Total DDT	35437.5	170920.7	50
Dicofol (Kelthane)	*	*	50
Dichlorobenzophenone, p,p'	ID	ID	0
Dieldrin	*	319.8	50
Endosulfan I	*	*	45
Endosulfan II	*	*	28
Endosulfan sulfate	*	*	28
Total Endosulfan	*	*	45
Endrin	*	*	50
Ethion	*	*	50
HCH, Alpha	*	56.3	50
HCH, Beta	*	*	50
HCH, Delta	*	*	50
HCH, Gamma (Lindane)	*	122.1	50
Total HCH	*	207.4	50
Heptachlor	*	*	50
Heptachlor Epoxide	*	*	50
Hexachlorobenzene	*	*	50
Methoxychlor	*	*	50
Oxadiazon	*	*	28
Parathion, Ethyl	*	*	50
Parathion, Methyl	*	*	50
PCB-1248	*	*	50
PCB-1254	3736.1	7542.8	50
PCB-1260	5855.5	44827.8	50
Total PCB	11243.0	54047.6	50
Pentachlorophenol	ID	ID	0
2,3,5,6-tetrachlorophenol	ID	ID	0
Toxaphene	*	*	50

ID = Insufficient number of data points to calculate the EDL.
 * = EDL lies below the detection limit.

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